

COMPARISON OF HEALTH BEHAVIORS IN ADOLESCENTS WITH AND WITHOUT
ENDOMETRIOSIS

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Abstract

Definitive risk factors for endometriosis remain unknown due to the lack of knowledge concerning the pathogenesis of the condition, and little research has evaluated endometriosis within the adolescent population. The purpose of this cross-sectional descriptive study was to compare the exercise habits, cigarette smoking, alcohol consumption, and caffeine intake between adolescent girls with and without endometriosis. Health behaviors were assessed using a researcher-developed mailed questionnaire. A convenience sample of girls between 13 and 21 years of age consisted of 24 girls without endometriosis and 15 girls with endometriosis. Girls with endometriosis were significantly less likely to perform aerobic and strength-training exercises than girls without endometriosis. There were only three current smokers in the study; all three had endometriosis, and more girls with endometriosis had tried smoking. More girls with endometriosis currently drink alcoholic beverages compared to girls without endometriosis. No differences were found between the groups regarding caffeine intake, but all of the girls with endometriosis who had quit drinking caffeine did so for health-related reasons. The findings suggest that lack of aerobic exercise and strength-training activities is associated with endometriosis, although whether it is the cause or effect is unknown. Further research is needed to determine whether or not there is an association of alcohol and cigarette smoking with endometriosis, but the findings from this study suggest that girls with endometriosis are more likely to drink alcoholic beverages and smoke cigarettes. Additional research is also needed to evaluate caffeine consumption and the influence of ceasing caffeine intake related to endometriosis.

Comparison of Health Behaviors in Adolescents with and without Endometriosis

The adolescent years for young women are an exciting and eventful time of life, but unfortunately some adolescent girls do not experience the optimum quality of life because they are victims of the symptoms associated with endometriosis. Dysmenorrhea is one of the most common symptoms, and 50% of teenagers with intractable dysmenorrhea have been diagnosed with endometriosis (Cramer & Missmer, 2002). This suggests that adolescents who require bedrest and analgesics for their painful menstruation have an increased possibility of having endometriosis and require additional effort for early detection or prevention (Cramer & Missmer, 2002).

The pathology of endometriosis is not well understood, making the facilitating factors unknown (Murphy, 2002). Current research has associated family history with an increased risk of developing the disease. In particular, an adolescent with a first-degree relative with endometriosis has a 6.9% risk compared to the 1% risk for the general adolescent population without an affected relative (Emans & Goldstein, 1990). Other non-modifiable risk factors of adult-aged women who have been studied include history of autoimmune diseases and menstrual characteristics such as length of cycle, age at menarche, and heaviness of menstrual flow (Murphy, 2002). The association of health behaviors such as exercise habits, cigarette use, alcohol consumption, and caffeine intake to endometriosis has also been studied, but further research is indicated since results have been inconsistent in these areas.

The purpose of this cross sectional descriptive study was to compare the health behaviors of exercise, cigarette smoking, alcohol consumption, and caffeine use between adolescents who have been diagnosed with endometriosis and those who have not. The results of this study will

supply further data regarding modifiable lifestyle factors, and will provide a new perspective of these risk factors concerning the adolescent population. Also, further knowledge of the facilitating factors associated with endometriosis will allow health care providers to implement and educate adolescents about possible preventative strategies.

Review of Literature

The pathogenesis of endometriosis is not well understood, but the condition is typically defined as the presence of functioning endometrial tissue outside the uterus (Murphy, 2002). Endometriosis occurs most commonly within the pelvis, but can be found in extrapelvic regions such as the gastrointestinal tract, the urinary tract, lungs, and nerves (Murphy, 2002). Although the suspicion of atypical tissue growth can be present via pelvic examination, history, or a patient's subjective symptoms, an actual diagnosis of endometriosis requires objective visualization of the pelvis with surgical intervention by laparoscopy or laparotomy (Murphy, 2002).

The most common symptoms of pelvic endometriosis are dysmenorrhea, dyspareunia, infertility, and pelvic pain (Murphy, 2002). The pain may be described as beginning prior to the first day of menstruation, and may progress to a chronic symptom noted throughout the majority of the menstrual cycle (Murphy, 2002). However, endometriosis is not the certain cause of menstrual pain, and paradoxically, endometriosis has been found in women with no reported symptoms.

Endometriosis has been diagnosed in about 10%-15% of premenopausal women (Cramer et al., 1986). This most likely underestimates the true prevalence of this condition since there is an unknown percentage of women with undiagnosed yet suspected endometriosis, women who are asymptomatic, and women who do not seek treatment (Signorello, Harlow, Cramer,

Spiegelman, & Hill, 1997). Moreover, there is often a significant delay in diagnosis of endometriosis (Hadfield, Mardon, Barlow, & Kennedy, 1996). This introduces the question of whether endometriosis develops at menarche or over time, and establishes the necessity to study the prevalence and associated factors of endometriosis in adolescent girls.

Definitive risk factors for endometriosis remain unknown due to the lack of knowledge concerning the pathogenesis of the condition. Studies continue to be conducted to collect evidence associating a diagnosis of endometriosis with non-modifiable factors such as family history, menstrual characteristics, and history of autoimmune disorders as well as to modifiable behaviors including exercise habits, caffeine intake, alcohol consumption, and tobacco use.

Non-Modifiable Risk Factors

Family History.

Genetics plays an important role in many conditions, and previous research evidence supports the idea that there may be a heritable aspect to developing endometriosis (Moen & Magnus, 1993). One study in particular examined the occurrence of endometriosis in mothers and sisters of patients diagnosed with endometriosis by laparoscopy compared to women for whom endometriosis was ruled out by laparoscopy (Moen & Magnus, 1993). The risk for developing endometriosis was seven times greater in mothers and sisters of patients with endometriosis (Moen & Magnus, 1993). The researchers also suggested that daughters of women with endometriosis may possess a similar increased risk.

Menstrual Characteristics.

A number of studies have been conducted evaluating menstrual characteristics as a contributing factor of endometriosis. Most epidemiologic studies focused on this topic have found a positive association between women with endometriosis and beginning menarche at or

before age eleven, with a shorter cycle length, defined as 27 or fewer days (Cramer & Missmer, 2002). One descriptive study compared menstrual characteristics of infertile women diagnosed with endometriosis with women who had delivered a live-born child (Cramer et al., 1986). Significant results were not found regarding heaviness of menstrual flow and regularity of cycle. However, women with endometriosis had cycle lengths 27 days or less, suggesting that a shorter menstrual cycle increases risk (Cramer et al., 1986). There was also a trend for earlier menarche in the women with endometriosis of 12.4 years compared to 12.7 years for women without endometriosis (Cramer et al., 1986). There were no statistically significant results regarding these menstrual qualities, and this type of study cannot show whether the associated trends are precursors or early manifestations of the disease. Thus, there is still uncertainty regarding menstrual factors contributing to an increased or decreased risk for the condition.

History of Autoimmune Disorders.

An additional non-modifiable risk factor that has recently been studied is history of autoimmune and endocrine diseases that are thought to be more common in women with endometriosis than women in the general population (Sinaii, Cleary, Ballweg, Neiman, & Stratton, 2002). One cross-sectional survey study found that hypothyroidism, fibromyalgia, chronic fatigue syndrome, autoimmune disease, allergies and asthma were significantly more prevalent in women with endometriosis than in women in the general American population (Sinaii et al., 2002). These findings support the idea that endometriosis is associated with other conditions related to altered immune function, but further research is needed since this is a relatively new finding, and since no other studies on this topic could be found.

Modifiable Risk Factors

When evidence supports the association of non-modifiable risk factors with endometriosis, and when the cause of the condition is unknown, it is essential to identify modifiable risk factors so that prevention can be implemented when possible. Modifiable risks that have been studied include lifestyle factors such as exercise habits, tobacco use in the form of cigarettes, caffeine intake, and alcohol consumption.

Exercise.

Regular exercise may lower estrogen levels, and lowered estrogen has been associated with a decreased risk for endometriosis (Baker, Mathur, Kirk, & Williamson, 1981). One case-control study included a primary control group of 89 fertile women without endometriosis (mean age of 34.7 years), a secondary control group of 47 infertile women without endometriosis (mean age of 33.6 years), and a case group of 50 women with infertility-associated endometriosis (mean age of 33.4 years). Data were collected from a self-administered questionnaire that included questions regarding exercise behavior (Signorello et al., 1997). Results produced a finding of no relationship between engaging in vigorous exercise and endometriosis (Signorello et al., 1997). Vigorous exercise included jogging, swimming, cycling, calisthenics, power walking, aerobic sports, and the use of various cardiovascular exercise machines, and produced the protective effect in the fertile control group only. The results were further limited to women who indicated exercising vigorously more than four hours per week, who were found to have a decreased risk of 65% compared to those who exercised less than four hours per week (Signorello et al., 1997). These results leave room for further research since the challenge of collecting data that reflects exercise habits before the onset of endometriosis makes it difficult to differentiate between the

idea of exercise preventing the development of endometriosis and whether women without endometriosis exercise more because they are not debilitated from the disease.

An “index date” was developed in another study as a way to try to determine if behaviors such as exercise were the cause or effect of endometriosis in infertile women (Cramer et al., 1986). The sample of this multicenter study compared infertile women who had no living children and had a diagnosis of endometriosis with control subjects who were delivering a live-born child. The majority of all women in both groups were between the ages of 30-34 at the time of interview. The index date for cases was calculated by subtracting the number of months she had been trying to conceive from the first date on which she consulted a specialist on infertility, and for the controls it was the estimated date of conception for the first live-born child (Cramer et al., 1986). Only the events that occurred before the index date for both groups were considered as relevant. Findings regarding exercise habits indicated that women who had exercised before their index dates had a significantly lower risk for endometriosis than women who had not (Cramer et al., 1986). The inverse relationship was restricted to women who had begun their physical activity before age 25 and who exercised more than two hours per week, and was most notable in conditioning exercises such as jogging or calisthenics. The correlation between a decrease in endometriosis risk and exercise early in life provides the interesting opportunity to study the exercise habits of adolescent women both affected and not affected by endometriosis as a way to further test this association.

Tobacco.

The previously described study (Cramer et al., 1986) also evaluated the association of endometriosis with tobacco use. Results from the interviews showed that smokers who had reported starting smoking cigarettes before 17 years of age and who smoked a pack or more of

cigarettes per day had a significantly lower risk for endometriosis (Cramer et al., 1986), which is consistent with the idea that smoking lowers the estrogen levels (MacMahon, Trichopoulos, Cole, & Brown, 1982), and is similar to the effect of regular exercise. This study provides further opportunity to study adolescents since, like the results from the exercise portion, smoking produced the greatest significance on endometriosis risk when initiated at an early age.

Fortunately, not all research studying the association of tobacco use and endometriosis supports the problematic finding that smoking decreases risk of endometriosis. A case-control study comparing women with laparoscopic-diagnosed endometriosis with women in whom endometriosis was not found by laparoscopy found no consistent relationship between smoking status and incidence of endometriosis (Berube, Marcoux, Maheux, & the Canadian Collaborative Group on Endometriosis, 1998). Nor was an association found in a hospital-based case-control study comparing characteristics of fertile women without endometriosis, infertile women without endometriosis, and infertile women with endometriosis (Signorello et al., 1997). The inconsistencies of the findings of current research regarding tobacco use in the form of cigarettes and risk of endometriosis present the need for further study. Most notable focus should be on an adolescent target population since the findings that were significant are influenced by the age of onset of smoking, and since tobacco use in adolescent girls with endometriosis has yet to be studied.

Caffeine.

One study considered the association of caffeine intake with the prevalence of endometriosis, therefore making it a topic of interest for future research. The case-control study had the objective to identify the relationship of sociodemographic, gynecologic, and lifestyle factors to endometriosis in infertile women (Berube et al., 1998). All women underwent

laparoscopy, and cases were women diagnosed with endometriosis at the time of laparoscopy while controls were women in whom no endometriosis was found by laparoscopy (Berube et al., 1998). A personal interview was conducted after laparoscopic exam to obtain data such as estimated measurement of caffeine intake in milligrams per cup of each specific caffeinated beverage. Results showed that women who reported a caffeine intake of at least 300 mg per day (about 3 cups of instant coffee according to the study estimates) in the month before laparoscopy were more likely to have endometriosis than those whose average caffeine intake was lower than 100 mg per day, suggesting a positive association between caffeine intake and endometriosis (Berube et al., 1998). Further evidence needs to be found to support this association since this is the only study that evaluated the association of caffeine intake with the prevalence of endometriosis, and since the biological explanation of the association is currently unknown (Berube et al., 1998).

Alcohol.

Conflicting research has been found evaluating the association of alcohol consumption and the prevalence of endometriosis. Results from one case-control study support the idea that alcohol increases estrogen levels that stimulate the growth of endometrial tissue, and subsequently increases the incidence of endometriosis (Reichman et al., 1993). All subjects of the study had a diagnostic laparoscopy on any day of the menstrual cycle. Cases were women with diagnosed endometriosis and controls were women with no endometriosis according to the laparoscopic visualization (Berube et al., 1998). Subjects were then interviewed about various lifestyle characteristics including alcohol intake.

Results showed that an intake of three or more alcoholic drinks per month was associated with an increased prevalence of endometriosis (Berube et al., 1998). These results suggest that

increased alcohol use is associated with an increased incidence of endometriosis, but an additional study found that endometriosis was not significantly associated with alcohol consumption (Signorello et al., 1997).

Epidemiologic data were collected from a self-administered questionnaire from cases (women diagnosed with endometriosis by laparoscopy), a fertile control group, and an infertile control group. According to the results, women who reported any “regular consumption” (one or more times per week) of alcohol had a non-significant increase in risk of endometriosis compared to nondrinkers (Signorello et al., 1997). The increase could be due to confounding factors. The researchers suggested that the increase in alcohol consumption among women with endometriosis could be an attempt to cope with the reported pelvic pain that is associated with the disease (Signorello et al., 1997). The possible confounding factors along with the conflicting results of current research indicate that further studies need to be conducted on the association of alcohol consumption and endometriosis.

To summarize, there is a substantial amount of information that needs to be identified about all aspects of endometriosis, but the most significant to nursing practice is the potential risk factors that can be modified. Identifying modifiable lifestyle characteristics will provide the opportunity for nurses to educate women about ways to prevent this disease. This is particularly important with the evidence that there are many non-modifiable risk factors, because women with one or more unchangeable risks can be especially conscientious of avoiding modifiable lifestyle habits that could further increase their possibility of having endometriosis.

Current research studying the association of exercise, tobacco, caffeine, and alcohol with endometriosis has presented the need for further research of these modifiable lifestyle characteristics in women with endometriosis. The results regarding exercise habits have shown

that exercise has an inverse relationship with the incidence of endometriosis, but results were limited to vigorous callisthenic-type exercises started at an early age and practiced at least four hours per week. Cross-sectional research collects data at one point in time, which presents the speculation that this relationship might be because women without endometriosis presumably are not in pain, as are women with endometriosis, and thus may be more willing and able to exercise.

Results of research studying cigarette smoking related to endometriosis have been inconsistent. One study found no significant relationship between tobacco use and endometriosis, while another associated a decreased incidence of endometriosis in women who started smoking before age 17 and who smoked a pack or more per day only.

Caffeine intake needs further research since only one study was found. This study suggested that increased consumption of caffeine increases prevalence of endometriosis, but further evidence is needed to support this idea since the biologic reasoning of the association is unknown.

Research has found an increased prevalence of endometriosis with increased alcohol intake, but other studies have found no significant association. Also, confounding factors such as increased alcohol consumption used for coping with pain related to endometriosis have been suggested as the explanation for the direct relationship.

Additional research is also needed concerning the sample used when studying the association of modifiable risk factors with endometriosis. All research found on this topic studied adult-aged women without specifying their ages at the time of diagnosis, and did not consider the diagnosis of endometriosis in adolescent girls. Results of some studies suggested an association of endometriosis with modifiable behaviors, but the association was dependent on the behavior being initiated at an early age, which indicates the need to study those behaviors occurring at the time of

adolescence. It is also important to study modifiable lifestyle characteristics of adolescents with endometriosis so that evidence can be contributed to the process of determining whether endometriosis is present at the time of menarche or develops over time. Therefore, the purpose of this cross sectional descriptive study is to compare various health behaviors between adolescents who have been diagnosed with endometriosis and those who have not. The research questions specific to this study were:

1. Do adolescent girls with endometriosis exercise less than adolescent girls without endometriosis?
2. Do girls with endometriosis smoke cigarettes less than girls without endometriosis?
3. Do girls with endometriosis drink more caffeine than girls without endometriosis?
4. Do adolescent girls with endometriosis consume more alcoholic beverages than girls without endometriosis?

Methods and Design

Sample

The target population was adolescent girls who were currently between the ages of 13 and 21 years, since this is often the adolescent age range in pediatric practice. For the purposes of this study, the inclusion criteria were female gender, aged 13-21 years, English speaking, and postmenarchial. Adolescents diagnosed with gynecological cancer were not included in this study to eliminate the possibility of misperceived identification of pelvic pain. In addition, adolescent girls who had been pregnant were excluded since there is evidence supporting the idea that pregnancy facilitates the resolution of lesions associated with endometriosis (Editors of Salem Press, 1995).

The goal was to obtain 40 adolescents in both the diagnosed group and in the non-diagnosed group, resulting in 80 total participants. Thirty-nine total participants were actually recruited for the study, due to the low prevalence of adolescent girls having endometriosis. Participants were recruited via fliers posted at various locations throughout the community such as grocery stores, local libraries, schools, etc., and via an ad placed in 26 local newspapers in the Columbus metropolitan area. Additional girls with endometriosis responded to a listerv posting on an Internet support group for adolescents with endometriosis.

Human Subjects.

The Ohio State Social and Behavioral Sciences Human Subjects Review Committee was provided with all necessary information of the study. After approval from the Committee, community facilities such as local libraries, schools, and grocery stores were contacted for approval of the posting of the informational flier.

All human rights were protected in this study. Participants who are eighteen years old or older voluntarily signed an informed consent form. Participants younger than eighteen years old signed a consent form that also required the signature of a parent or guardian on the consent form. The vulnerability of the population was taken into consideration, as well as the personal nature of some of the questions asked regarding reproductive history and sexual issues. Participants were informed that any question could be left unanswered. In addition, questions asked about subjects' use of alcohol, and there could have been a legal risk for underage women responding to the questionnaire, if they could be identified. However, in this study subjects could not be identified. Consent forms were separated from the questionnaire as soon as they were received.

The nature, purpose, and the researcher's responsibilities of the study were described fully to potential participants in understandable terms, as well as the participant's right to refuse participation. To preserve self-determination, participants volunteered to participate in the study. Also, participants were made aware that they were able to terminate their participation, refuse to provide information, or ask for more information at any point in the study without fearing prejudice on the part of the researcher.

Confidentiality was ensured, as there was no identification data asked on the questionnaire, and participants were instructed to fill out the questionnaire alone. The consent forms were kept separate from the data forms throughout the study to disassociate identification from personal data. Confidentiality throughout the research process was maintained, making certain that all information was kept in a locked file only accessible to those involved in the research, and that information will not be published in a manner in which data can be specifically linked to the participant. In addition, all data will be destroyed once the research study is complete.

Operational definitions.

Since endometriosis is technically diagnosed only by direct visualization, it was defined in this study as being diagnosed by a physician after performing a laproscopic exam, receiving a verbal diagnosis by a physician or nurse practitioner, or being unsure about these two circumstances. Health behaviors were identified as smoking, exercise, alcohol, and caffeine, which were defined in accordance to the information asked on the questionnaire. Adolescent was defined as being aged 13-21 years, and girl in this study refers to being of female gender and postmenarchial.

Instrument.

A researcher-developed demographic form was used to describe sample characteristics because there were no suitable instruments found in the literature. Also, a survey instrument tool was developed specific to this study. Questions were derived from current research findings and addressed each of the four lifestyle variables of interest. Information about exercise habits included type of exercise, duration of each exercise session, and how many sessions are completed per week. Examples of questions regarding tobacco use asked type of cigarette smoked, number of cigarettes smoked per day, and smoking history. Questions about caffeine intake asked about type of caffeinated beverage consumed and number of caffeinated beverages consumed per week. Examples of information asked about alcohol consumption are type of alcoholic beverage consumed and number of beverages consumed per week. Content validity for the research tool was established by the use of an expert panel, representing each of the fields pertaining to the variables of interest. The experts evaluated the appropriateness and suitability of the questions on the tool used in this study. From there, certain questions were eliminated or added according to the expert's judgment. In addition, four adolescents within the sampled age range pre-tested the questionnaire to ensure the clarity of each question and to determine the estimated time of completing the questionnaire. No modifications were needed to the pre-tested questionnaire.

Procedure.

After the approval from various community sites, an informational flyer was posted throughout the community at libraries, schools, grocery stores, etc., informing potential participants that they had the chance to be involved in a confidential study being conducted by an honors nursing student from The Ohio State University. There was also a newspaper ad placed in

26 local newspapers for one week at three different time intervals. The researcher's telephone number and email address was listed for additionally needed information and as a contact for those who were interested in participating in the study. A posting was placed on an Internet support group for adolescent girls with endometriosis with the same contact information and study description.

Participants who responded to the posted flyer, ad, and listerv were informed of the details of their participation through email or a telephone conversation. They were also informed that upon their completion of the questionnaire, a movie ticket for one admission to AMC theaters would be sent to them as a thank you for their time. Once the girls agreed to participate, they were sent a packet containing a parental consent form for adolescents younger than 18 years of age with an area for the minor participant to indicate her assent, or a consent for those who were 18 years old or older. The questionnaire and movie ticket were also enclosed, and a self-addressed stamped envelope was included to mail the survey back to the researcher. Contact information was listed if any questions needed to be answered while the participant was filling out the questionnaire. Additionally, a list of resources was provided for the rare occasion that a participant might experience distress while completing the questionnaire.

In addition to the full-disclosure of the study, all participants were given the option of receiving a copy of the completed study and/or results if she or her parent so desired. It was also noted that the incentive of a movie pass was given to participants as a thank you.

Analysis

The sample demographics were described by descriptive statistics including frequency, percentage, means, and standard deviations. Other data were analyzed using appropriate measures: Nominal data were analyzed using Chi square analysis and Fisher's Exact test, and t-

tests were used to test differences of means when continuous data were available. The alpha level for both tests was .05.

Results

Frequencies and descriptive statistics were used to evaluate the demographic characteristics of the sample, and the results are presented in Table 1. The 39 girls in the study ranged in age from 13 to 21 years, with a mean of 18.9 (SD=2.5). Only three participants defined themselves as a race other than Caucasian. The majority of the participants are in college, and two-thirds of the participants are employed, nearly all part-time. The average years of education was 13.0 (SD=2.6), with a range of seven to seventeen years. Menarcheal age ranged from nine to fifteen years, and the mean was 12.2 (SD=1.2).

Fifteen of the participants believed that they had endometriosis; eleven of these girls had had the diagnosis confirmed by laparoscopy or surgery. For the purposes of this study, all fifteen were included in the “with endometriosis” group. The remaining twenty-four participants had received no indication of having endometriosis. There was no difference between the groups regarding demographic characteristics, including having a first-degree relative with endometriosis.

Research question #1: Do adolescent girls with endometriosis exercise less than girls without endometriosis?

Girls with endometriosis were significantly less likely to exercise than were girls who do not have endometriosis. Girls with endometriosis performed aerobic exercises an average of 1.47 days per week, while girls without endometriosis exercised an average of 3.3 days ($t=-2.83$, $p<.01$). However, results in Table 2 show that there was not a statistically significant difference in the duration of time per aerobic exercise session for those with and without endometriosis.

Girls with endometriosis performed strength-training exercises significantly less than girls without endometriosis. Girls with endometriosis performed these exercises an average of 1.1 days per week, while girls without endometriosis performed them 2.8 days ($t=-2.53$, $p<.05$). As shown in Table 3, session duration was also less for girls with endometriosis (Chi-Square=13.26, $p<.01$). There was no significant difference of the frequency or duration per session of non-aerobic activity between the two groups (not shown).

Research question #2: Do girls with endometriosis smoke cigarettes less than girls without endometriosis?

The three girls from the sample who currently smoke cigarettes all have endometriosis, and indicated that they smoke cigarettes daily. There was no significant difference in the cigarette smoking habits of girls with endometriosis compared to girls without endometriosis. Results in Table 4 indicate that the majority of girls with endometriosis have tried smoking cigarettes, and only about half of the girls without endometriosis indicated having ever tried smoking “one or two puffs” of a cigarette.

Research question #3: Do girls with endometriosis drink more caffeine than girls without endometriosis?

Adolescent girls with endometriosis are equally as likely to drink caffeinated beverages as girls without endometriosis. As shown in Table 5, there were no significant findings regarding caffeinated beverage consumption. The majority of girls in both groups drink caffeinated beverages, and were eight years old or younger when they started drinking caffeinated beverages. Three girls with endometriosis and two girls without endometriosis have quit drinking beverages containing caffeine. All of the girls with endometriosis indicated the reason for

quitting as being related to health improvement, while the girls without endometriosis stopping drinking caffeine for both health and non-health related reasons.

Research question #4: Do adolescent girls with endometriosis consume more alcoholic beverages than girls without endometriosis?

The girls with endometriosis are no more likely to drink alcoholic beverages than the girls without endometriosis (see Table 6). However, there is concern with the significance of this value due to the small sample size. The majority of girls from both groups drink primarily on the weekend, and drink mostly beer. Of the girls who do drink alcoholic beverages, there was little difference regarding the number of alcoholic drinks consumed at one time and the frequency of consumption.

The majority of girls from both groups indicated drinking five or more alcoholic drinks at a time on one or no day within the last month. Most of the girls with endometriosis drank alcoholic beverages three to five days within the last month, while the majority of girls without endometriosis drank six to nine days within the last month. In addition, there was no difference in the age of first drinking alcoholic beverages between the endometriosis and non-endometriosis group, with the majority from both groups drinking alcoholic beverages for the first time at 15 years of age or older.

Discussion

There was no difference between the groups regarding non-modifiable characteristics such as age, race, education, employment, and family history of endometriosis, but certain modifiable health behaviors appear to be associated with endometriosis. Results indicate that girls with endometriosis are less likely to exercise using aerobic activities, which is similar to Signorello, et al. (1997) and Cramer, et al. (1986). Findings also include strength-training

activities as being less prevalent among the girls with endometriosis. However, it is unknown if the lack of exercise preceded the onset of the disease, or if the lack of exercise is due to the pain and discomfort associated with endometriosis. Future longitudinal research is indicated to determine if aerobic and strength-training exercises could help prevent or delay the onset of endometriosis in adolescents.

It may be that girls with endometriosis are more likely to smoke cigarettes currently as well as to ever try smoking cigarettes, but a larger sample is needed to test this hypothesis. Cramer et al. (1986) found a decreased risk for endometriosis among smokers who began smoking before age 17, which is inconsistent with this study's findings. More girls with endometriosis than without endometriosis currently or previously smoked cigarettes, which suggests a trend of cigarette smoking within this population. Smokers with endometriosis may use cigarette smoking as a coping mechanism for the pain caused by the disease.

Although no difference was found between the groups regarding the amount and frequency of caffeine consumed, it is interesting that the girls with endometriosis who stopped drinking caffeinated beverages did so for health-related purposes. However, it is unknown if this was done due to the suggestion of a health care provider or if ending caffeine consumption has had a beneficial effect. Berube et al. (1998) found a positive association with caffeine and endometriosis, but did not assess the effects of ceasing caffeine intake. Future research is needed to determine the association of caffeine with endometriosis, and to examine the potential effects that ending caffeine intake has on the endometriosis disease process.

Due to the small sample size, additional research is needed to support the findings that girls with endometriosis may drink alcohol more than girls without endometriosis. This finding could be because adolescents with endometriosis use alcohol to alleviate pelvic pain. Berube et

al. (1998) found that drinking three or more alcoholic drinks per month was associated with endometriosis, but excluded women with severe pelvic pain to rule out the idea that alcohol is used as a coping mechanism. Consequently, additional research is needed regarding adolescents with endometriosis and alcoholic beverages and reasons for consumption.

Limitations of this study include the small sample size because of the difficulty in locating adolescents with endometriosis in the central Ohio area. An Internet endometriosis support group was contacted to increase the number of participants with endometriosis. Consequently, the majority of girls with endometriosis were from various areas of the United States while the participants without endometriosis were from the Columbus metropolitan area. The differences in the cultural aspects of the geographical locations could influence the health behaviors and lifestyle choices of the participants. Therefore, a replication of this study using adolescents from one geographical area with racial diversity is needed to confirm these findings.

Conclusion

Facilitating factors of endometriosis are unknown due to the lack of knowledge regarding this condition. Current research has studied both modifiable and non-modifiable risk factors and their association with endometriosis in adults. Some association has been identified regarding modifiable health behaviors and endometriosis in adolescents, an under-studied population. These aspects are important to identify among the adolescent population to provide the opportunity for health care providers to intervene. Suggesting appropriate lifestyle changes in adolescents with endometriosis could make a difference earlier in the disease process, therefore significantly decreasing the amount of time that the woman has to experience the debilitating pain and discomfort associated with endometriosis.

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Appendix

Table 1.

Demographic Characteristics of Adolescents with and without Endometriosis (n=39)

Characteristic	<i>n</i>	%
Race		
African American	3	7.7
Caucasian	36	92.3
Educational Level		
Middle School	3	7.7
High School	6	15.4
College	30	76.9
Employment		
Unemployed	13	33.3
Employed part-time	23	59.0
Employed full-time	3	7.7

Table 2.

Duration (in minutes) of Aerobic Exercises in Adolescents with and without Endometriosis (n=39)

Duration (in minutes)	Endometriosis <i>n</i> (%)	Non-Endometriosis <i>n</i> (%)
No activity	6 (40.0)	3 (12.5)
30" or less	4 (26.7)	8 (33.3)
31" or more	5 (33.3)	13 (54.2)

Chi-square=4.03

p>.05

Table 3.

Duration (in minutes) of Strength-Training Exercises in Adolescents with and without Endometriosis (n=39)

Duration (in minutes)	Endometriosis <i>n</i> (%)	Non-Endometriosis <i>n</i> (%)
No activity	11 (73.3)	4 (16.7)
30" or less	1 (6.7)	10 (41.7)
31" or more	3 (20.0)	10 (41.7)

Chi-square=13.26

p<.01

Table 4.

Cigarette Smoking in Adolescents with and without Endometriosis (n=39)

Status	Endometriosis n (%)	Non-Endometriosis n (%)
Have tried smoking	12 (80.0)	13 (54.2)
Have not tried smoking	3 (20.0)	11 (45.8)

Chi-square=2.7
p>.05

Table 5.

Caffeinated Beverage Consumption in Adolescents with and without Endometriosis (n=39)

Status	Endometriosis n (%)	Non-Endometriosis n (%)
Drink currently & in past	12 (80.0)	17 (70.8)
Drink currently; not in past	0 (0.0)	3 (12.5)
Never have drunk	0 (0.0)	2 (8.3)
Have quit drinking	3 (20.0)	2 (8.3)

Chi-Square=4.21
p>.05

Table 6.

Alcoholic Beverage Consumption in Adolescents with and without Endometriosis (n=39)

Status	Endometriosis n (%)	Non-Endometriosis n (%)
Have tried alcohol	12 (80.0)	12 (50.0)
Have not tried alcohol	3 (20.0)	12 (50.0)

Chi-Square=3.5
p>.05